What is claimed is:

1. A device for converting between electrical energy and mechanical energy, the device comprising:

an electroactive polymer capable of converting between electrical energy and mechanical energy; and

at least two electrodes in electrical communication with the electroactive polymer,

wherein one of the at least two electrodes is a non-contact electrode, having a portion proximate to the electroactive polymer, that transfers charge to or from a portion of the polymer through a non-condensed medium without contacting the polymer.

2. The device of claim 1 wherein the medium comprises one of air, a gas, a liquid, and a supercritical fluid.

3. The device of claim 1 wherein the medium is a vacuum.

4. The device of claim 3 further comprising a seal between the polymer and the vacuum.

5. The device of claim 1 wherein the non-contact electrode comprises a charge source that transmits charge

6. The device of claim 5 wherein the charge source transmits charge directly to a surface of the polymer.

7. The device of claim 5 wherein the charge source generates charge having a voltage between about 10 volts and about 100 volts.

8. The device of claim 7 further comprising a bias voltage source or electric field source that raises the voltage difference of the opposite sides of the polymer to a value greater than that used to generate the charge.

9. The device of claim 5 wherein the charge source comprises a field emitter.

10. The device of claim 9 wherein the charge source comprises a microfabricated field emitter.

11. The device of claim 5 wherein the portion of the non-contact electrode proximate to the electroactive polymer comprises a sharp tipped metal.

12. The device of claim 11 wherein the sharp tipped metal is a Spindt cathode.

13. The device of claim 1 wherein the charge comprises an ion.

14. The device of claim 13 wherein the ion is positive.

15. The device of claim 1 wherein the non-contact electrode receives the charge from the polymer.

16. The device of claim 1 wherein the charge comprises an electron.

17. The device of claim 1 wherein the polymer is a monolithic electroactive polymer.

18. The device of claim 1 further comprising an array of pins that direct the flow of charge between the non-contact electrode and one or more active areas on the electroactive polymer.

19. The device of claim 1 wherein the distance between the non-contact electrode and the portion of the electroactive polymer is less than about 5 centimeters.

20. The device of claim 19 wherein the distance between the non-contact electrode and the portion of the electroactive polymer is between about 0.5 millimeters and about 5 millimeters.

21. The device of claim 1 further comprising a high voltage source that provide a voltage greater than 100 volts in electrical communication with the non-contact electrode.

22. The device of claim 1 wherein the electroactive polymer is a dielectric elastomer.

23. The device of claim 1 wherein a second electrode of the at least two electrodes is a compliant electrode attached to the polymer.

24. The device of claim 23 wherein the compliant electrode provides charge to actuate the polymer.

25. The device of claim 23 wherein the polymer is arranged in a manner which causes a portion of the polymer to deflect in response to a change in electric field and/or arranged in a manner which causes a change in electric field in response to deflection of the polymer.

26. The device of claim 1 further comprising a region of high conductivity, operably coupled to the polymer, that receives charge from the non-contact electrode and a region of low conductivity operably coupled to the polymer.

27. A method for operating an electroactive polymer in electrical communication with at least two electrodes, wherein one of the at least two electrodes is a non-contact electrode, having a portion proximate to the electroactive polymer without contacting the polymer, the method comprising transferring charge between the non-contact electrode and a portion of the polymer through a non-condensed medium to thereby operate the electroactive polymer.

28. The method of claim 27 wherein transferring the charge comprises generating the charge at a first voltage.

29. The method of claim 28 further comprising raising energy of the charge with a bias voltage.

30. The method of claim 27 wherein the charge is transferred from the non-contact electrode to the polymer.

31. The method of claim 30 wherein the charge is used to cancel opposite charge supplied by a contact electrode attached to the polymer.

32. The method of claim 27 wherein the medium comprises one of air, an ionized gas, and an inert gas.

33. The method of claim 27 wherein the medium is a vacuum.

34. The method of claim 27 wherein the charge comprises an ion.

35. The method of claim 34 wherein the ion is positive.

36. The method of claim 27 wherein the non-contact electrode receives the charge from the polymer.

37. The method of claim 27 wherein the charge comprises an electron.

38. The method of claim 27 further comprising directing the flow of charge between the non-contact electrode and the portion of the electroactive polymer using an array of pins.

39. A device for converting between electrical energy and mechanical energy, the device comprising:

an electroactive polymer capable of converting between electrical energy and mechanical energy; and

at least two electrodes in electrical communication with the electroactive polymer,

wherein one of the at least two electrodes is a non-contact electrode, having a portion proximate to the electroactive polymer, that transfers charge to or from a portion of the polymer through air without contacting the polymer.